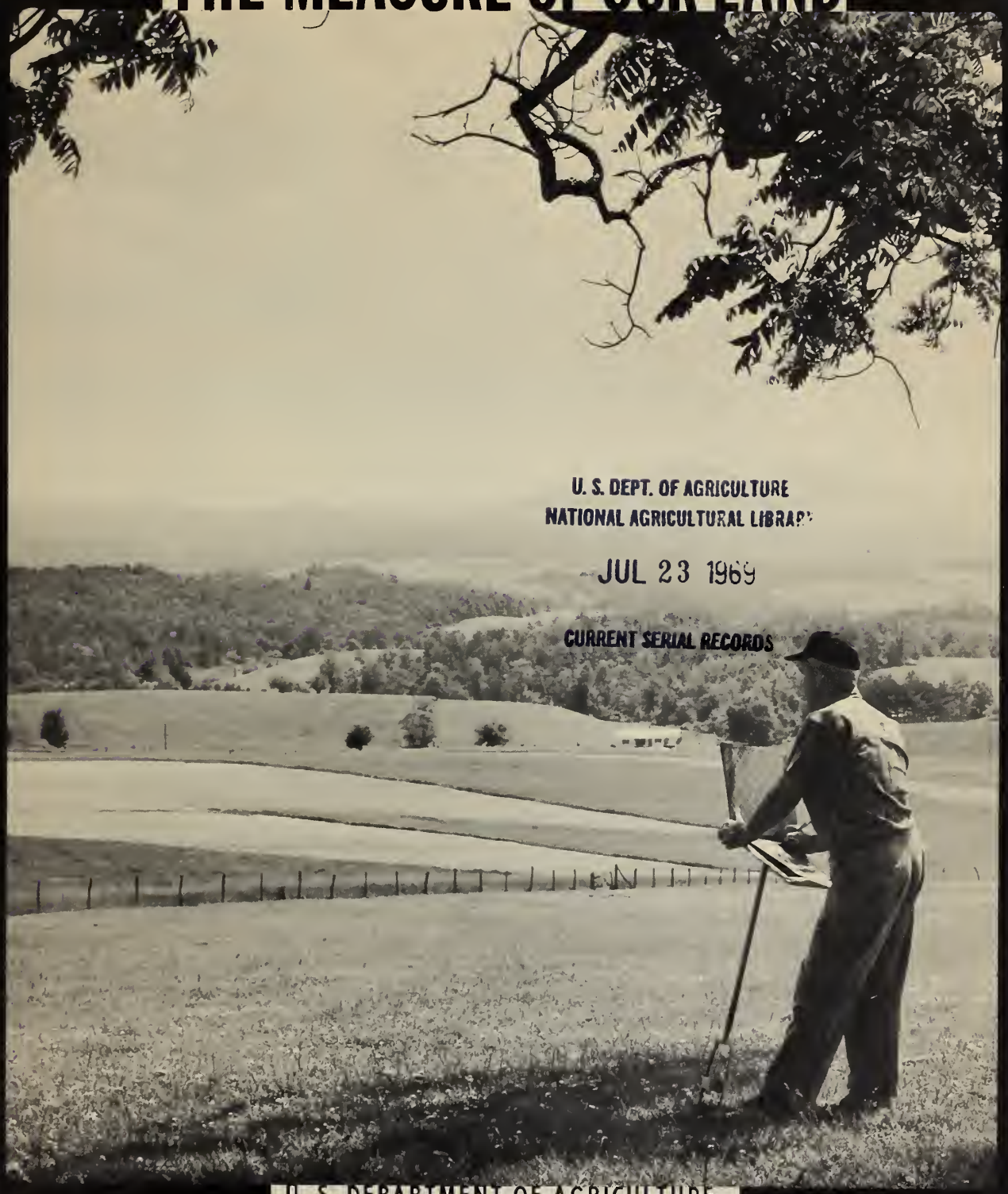
THE MEASURE OF OUR LAND



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
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The soil scientist has used an auger for studying soil layers from beneath the surface. After noting the soil characteristics, he gives the soil an identifying symbol and draws its boundaries on an aerial photograph.

THE MEASURE OF OUR LAND

No matter where we live and work, we need to be concerned about "our land."

In all parts of our country, farmland is being taken for roads, factories, and towns. Many owners sell at a profit, and much of the land is worth more to all of us in its new use. But the change takes away from our supply of land on which we can produce food and fiber.

As our population continues to increase, wise use of land becomes more important to all of us. City and county officials need to know what kind of land is being taken for roads and other nonfarm uses. Farmers and ranchers need to plan the use of their land so that they get good returns without damaging the soil. Stony or sandy areas that have low value for food production are more suitable for nonfarm uses. Some areas with fertile soil though ideal for housing might better be used for field crops. A wet place or a flood plain might be good for pasture and for some crops, but such an area brings trouble and loss if divided into building lots.

A farmer that uses land wisely ordinarily earns a good living, and he safeguards his part of our land for the future. But a farmer that cultivates land that is better suited for other uses is likely to earn only a poor living, and his soil may lose its structure or wash away. If he grows crops on a steep field of thin soil that is better suited for trees, the field gives him a meager return and loses part of its potential for trees because of erosion.

The land is made up of soils that differ in many ways. The ideal soil for most uses is nearly level and easy to work. It takes in and holds a good supply of water but does not stay wet. It contains plant nutrients and holds them—and holds those added in fertilizer. Most soils fall short of the ideal. Most soils are sloping; many are shallow, stony, wet, dry, sandy, or clayey or have other adverse features. Some of these features can be seen by almost anyone but others only by those specially trained.

A soil scientist is trained to study soils in great detail. In making a soil survey he first studies an aerial photograph to learn the lay of the land. Then he bores or digs many holes with an auger or spade to study the soil layers below the surface. He finds the boundaries of the different kinds of soil, draws the boundary lines on the aerial photograph, and gives each enclosed soil a symbol. In other words, he makes a soil map.

In the United States alone, soil scientists have described and mapped more than 70,000 different kinds of soil. For many uses it is easier to think about groups of soils than about individual soils. For this reason, soils are grouped in different ways depending on the purpose. Less specific information of course can be given about a group of soils than about individual soils.

Soil-Interpretation Classifications

Because soils have many uses, many interpretive classifications of soils are in use. Among them are those that guide long-range land use planning so good soils can be reserved for farming and soils poorly suited for farming can be put to other uses; that route highways and other public facilities over suitable soils so earthwork costs are not prohibitive; that warn against land leveling and removal of the surface where the soils are shallow to gravel or claypan; that help in selecting lots suitable for septic tank systems and in pointing out

those that can bring money and health problems to the homeowner; that help engineers determine costs of site preparation and foundation design and construction. The most widely used is the land-capability classification of farm and range land.

Land-Capability Classification

For nearly 30 years the Soil Conservation Service (SCS) has used the land-capability classification as a practical means of helping farmers and ranchers make conservation plans for their land. It stresses the soil features that limit what users can do without risk of damage.

The land-capability classification of the soils of any area is based on its soil map, and the soils are grouped at three levels—the land-capability unit, subclass, and class.

The land-capability units are abstracted from the soils shown on the soil map. All soils that have about the same soil-management needs and yields are grouped together and given a local land-capability unit designation and a local definition. Subclasses and classes, however, have nationwide definitions to make them meaningful and useful to many people. The subclass designations suggest the *kind* of limitation—"e" for erosion, "w" for wetness, "s" for unfavorable soil in the root zone, and "c" for adverse climate. The broad class designations suggest the *degree* of limitation—by a Roman numeral; the higher the number the greater the limitation and the fewer the choices of safe use.

Houses and artichokes on class I land. Construction is spreading up the slopes, class VII land.

Land-capability classes

Classes I, II, and III take in the soils that are suited for cultivated crops. Class IV land can also be used for crops, but the user must choose his crops with care or manage the soil with extra care, or both. Classes V, VI, and VII take in soils that are for the most part not suited for cultivation but will produce useful pasture, range forage, certain special crops, trees, or wildlife. Class VIII land has limitations that restrict its use mostly to recreation, wildlife, or water supply. Much rough or rocky class VIII land has scenic value.

Land suited for regular cultivation

Soils suited for regular cultivation are in classes I, II, and III. These soils can also be used safely for pasture, range, woodland, or wildlife.

Class I.—Class I contains the soils that are nearly ideal for some of the common field crops. They can be safely cultivated year after year without any special treatment to control runoff or conserve the soil. They are nearly level and the risk of erosion by either wind or water is low. They are deep, well drained, and easy to work. They hold water well and are either fairly well supplied with plant nutrients or they respond well to fertilizer. The local climate is favorable for the common crops. Class I land is suited to a wide range of crops and is not subject to overflows that damage crops. When cropped, it needs to be managed well to get good yields and to maintain the soil.

Class I has no subclasses since the soils have few or no limitations for farm use.

Class II.—Soils placed in class II have limitations that reduce the choice of plants or require some conservation practices. The limitations are few and the practices easy to apply, but the land user has less leeway in choice of plants or practices than with class I land. For example, among the practices that may be needed for cultivated

Mustard greens and potatoes grow well on this class I land; the risk of damage by either wind or water erosion is low.

This class IIe land needs conservation practices, but the practices are easy to apply.

(Bottom left) Conservation practices such as contouring and stripcropping give adequate protection from erosion on this class IIe land.

(Top right) Class VI land on the slopes overlooks class II land being used for roads, buildings, and crops.

(Bottom right) This class IIw land needs drainage.

class II land that is gently sloping and deep are contour tillage, stripcropping, stubble mulching, and cropping systems that include grass and legumes. Some class II land is nearly level and somewhat wet but can be drained easily.

Class III.—Soils placed in class III have severe limitations that reduce the choice of plants or require special care to save soil and water, or both. The fewer number of practical alternatives and the extra effort needed to conserve soil and water distinguish class III land from class II.

Limitations of class III land restrict the amount of clean tillage; the timing of planting, tilling, or harvesting; the choice or yield of crops; or two or more of these. Most of the limitations—for example, gentle to strong slopes, somewhat sandy soil, shallow soil, too little or too much water—were there before the land was used for crops. Some may be the result of erosion brought on by the way the land has been used.

(Top left) A livestock-water pit on class IIIw land. This land has a high water table and unless drained is seasonally ponded. The slopes are class VI land.

(Bottom left) Terraces help prevent water erosion on this sloping class IIIe land.

(Top right) Class IIIw land flooded for use as a duck field.

Land suited for limited cultivation

Class IV.—Soils placed in class IV have very severe limitations that make them marginal for common field crops, require extra care when cultivated, or both. The needed practices may not be as effective as they are for class II or III land. Most class IV land can, with proper safeguards, be used for pasture or range, wildlife food and cover, recreation, or woodland if the climate is favorable.

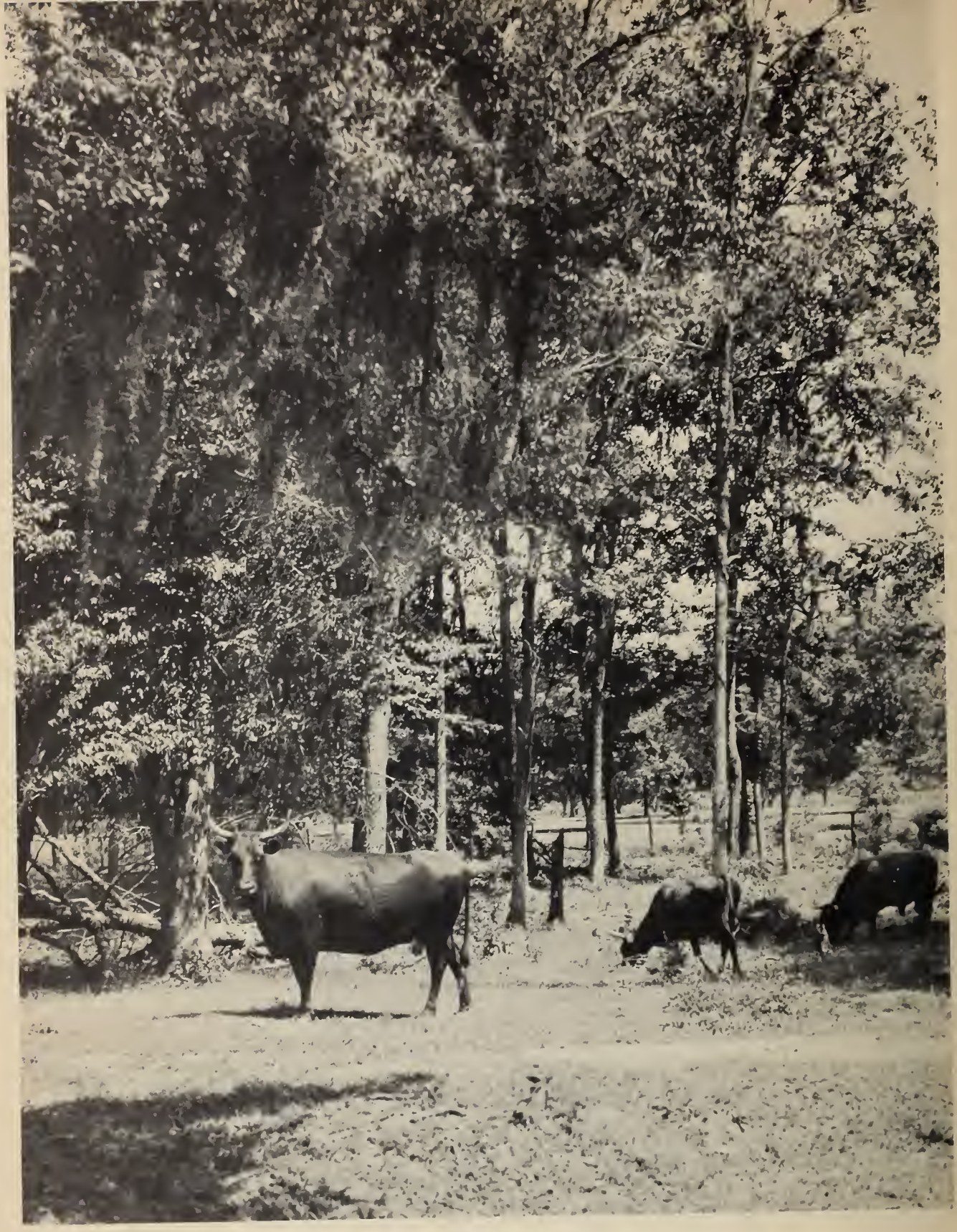
Some soils are placed in class IV though climate or overflow precludes planting or harvesting in a bad year. In humid areas many sloping soils that are suited for field crops once in a while but not year after year are in class IV. Some poorly drained, nearly level soils that are not subject to erosion but are poorly suited for some crops because of wetness, frequent overflows, or low yields are placed in class IV. Some class IV land is well suited for special crops such as rice, truck crops, fruits, nuts, or ornamental trees and shrubs.

In a somewhat dry climate, class IV land may produce good yields of some crops in years of above-normal rainfall, low yields in years of normal rainfall, and crop failures in years of below-normal rainfall. In such a climate special treatment and practices are needed to conserve moisture in the soil, maintain soil productivity, and prevent wind erosion.

Erosion from heavy rains on unprotected class IVe land.

This saline-alkali class IVs land has been irrigated to leach the salts to make it suitable for pasture.

Leveling class IVw land before planting rice.



(Left) This level class Vw land with no erosion hazard is too wet for cultivation but can be used safely for pasture.

This level class Vs land (foreground) cannot be cleared of rocks by practical means.

Land generally not suited for cultivation

Class V.—Soils placed in class V have little or no erosion hazard but have other limitations that are difficult to remove by practical means. The limitations prevent tillage of crops with standard farm equipment. Class V land is restricted largely to pasture, range, woodland, wildlife food and cover, recreation, or watershed protection. Though the land is nearly level or gently sloping, it is wet, stony, or often overflowed by streams, or the growing season is too short for most crops.

Class VI.—Soils placed in class VI have severe limitations that make them for the most part not suited for tillage and restrict their use largely to pasture, range, recreation, watershed protection, or wildlife food and cover. Some are well suited for woodland but some are not since the growth of trees depends on climate as well as soil.

Range or pasture improvements such as seeding, liming, fertilizing, and water control by means of con-

(Top left) Sloping stony class VIs land can be used safely for orchard.

(Bottom left) This class VIe land is too steep for safe cultivation but is suitable for pasture.

(Top right) Sheep grazing on open sagebrush range, class VI land, and moving toward the slopes, class VII land.

tour furrows, drainage ditches, diversions, or water spreaders are practical.

Some class VI land can be used safely for the common crops if managed with extreme care. Some also can be used for long-term meadows and sodded orchards that do not require tillage or for special crops, such as blueberries, that grow in soils unlike those that are best for the common crops.

Class VII.—Soils placed in class VII have one or more very severe limiting features that cannot be changed without major reclamation. The limiting features make them unsuited for common crops that need tillage and restrict their use largely to grazing, woodland, or wildlife food and cover. With specific management practices a few can be used for special crops—such as cranberries and certain ornamentals. Because of physical features of the soil, such pasture or range improvements as seeding and such water-control measures as contour furrows, ditches, diversions, and water spreaders are impractical to apply. This is a distinguishing difference between most class VI and class VII land. Some class VII land is well suited for woodland; some is not, mainly because of climate or the small amount of water held by the soil.

Because of dry climate and thin gravelly soil, range improvements are impractical on this class VIIs land.

Class VIIIs land like this rough rocky area has limitations that prevent its use for any type of farming—even for grazing or timber.

Class VIII.—Soils and landforms placed in class VIII have limitations that preclude their use for plants grown to be harvested. With major work a few can be "reclaimed" for special use. Some have scenic value. Benefits from wildlife use, watershed protection, or recreation are possible.

Badlands, rock outcrops, sandy beaches, mine tailings, and other nearly barren land are in class VIII.

Assumptions in the land-capability classification

The land-capability classification is made to help judge how farm and range land can be used safely. It is based on the combined effects of soil features and climate on the risk of soil damage, on limitations in safe use, and on the difficulty in applying conservation practices when the land is cultivated. (Shrubs, trees, or stumps are not considered soil features and do not affect land-capability classifying.) It is an interpretation made from a soil survey and differs from a taxonomic (or natural) soil classification, which is based on facts about soils that can be seen or measured.

Limitations are judged as they relate to current soil-using practices in the United States. For example, a rocky soil that cannot be tilled with machines is classified here as not suited for cultivated crops. But in a country where the soil is tilled by hand the same kind of soil might be classified as good for cultivated crops.

A fairly good yield is assumed for classifying any soil as suited for cultivated crops, grass, or trees. A level of management that is practical and within the skill of most farmers or ranchers is also assumed. Beyond this, the land-capability classification is not a guide to either yields or profits. Soils in classes I to IV may return more profit from grass or trees than from cultivated crops.

Each of the eight land-capability classes takes in many kinds of soil. Differences in yields of some plants may be greater between two soils in one class than between two soils in different classes.

This class VIIIc land could be made productive if water were available for irrigation. Rainfall here is less than 4 inches per year.

Class VIIIw land that is impractical to drain and useless for grazing may have important values as wildlife habitat.

Some land can be "reclaimed." For example, some wet soils can be drained, some dry soils can be irrigated, some salty soils can be leached of toxic salts, some overflows can be controlled. If a soil feature that limits the use of the land for common field crops is changed, the soil is then classified to reflect only the limitations that still affect its use. A soil with features that are not feasible to change is classified to reflect all its limitations.

New methods of farming bring about changes in the land-capability classification of some soils. Some placed in class IV 20 years ago are now in class II.

Where to get land-capability information

A land user who is a cooperator with his local soil conservation district can get soil and land-capability information through his district. This is part of the technical help of the Soil Conservation Service. SCS also gives onsite help in making and applying a conservation plan.

SCS publishes soil surveys, which are made in cooperation with the State land-grant universities and other State, Federal, and local agencies.

Your conservation district, local office of the Soil Conservation Service, county agent, or State agricultural experiment station can tell you if a soil survey of your county has been published and if copies are available. Recent published soil surveys can be bought from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Many libraries have them.

If a soil survey of your county has not been published, it is likely that field soil maps have been made of part or all of the county. If so, you can see the maps and related descriptions and interpretations in the office of the Soil Conservation Service and probably can get copies of the maps and of land-capability data and other related data if you pay for having them made.

An Inventory of Our Land

The land-capability classification helps make broad summaries of the land suitable for cultivation and other uses. A summary at the level of the eight classes is useful, even though it reveals only major suitabilities and limitations. It cannot begin to show the kinds of soil that must be considered in planting and caring for crops, in managing rangeland or forests, in building a house, a dam, a highway, or in planning recreation sites or wildlife habitats.

A study of land capability was begun in 1958 by agencies of the U.S. Department of Agriculture as part of the National Inventory of Soil and Water Conservation Needs. Soil survey data from sample areas in every county were interpreted and expanded to estimate land capability and land use. The sample areas were rural, non-Federal land in all the States, Puerto Rico, and the Virgin Islands.

The Inventory, now being updated, showed that about half of the non-Federal rural land in the 48 mainland States is suited for cultivation. The other half is better suited for uses that keep it in longtime plant cover. Only 3 percent of this land, or 36 million acres, is in land-capability class I.

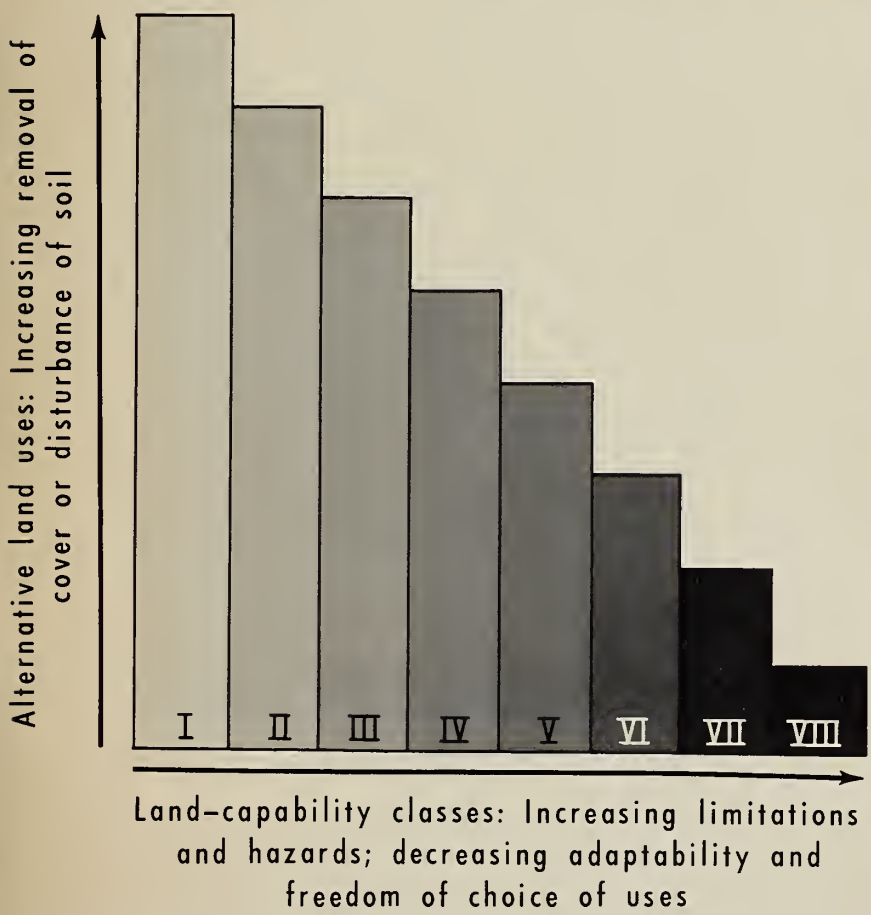
All the other land needs conservation treatment to some degree if used for a crop that requires tillage with standard farm equipment.

About 44 percent of the non-Federal rural land or 637 million acres is in classes I, II, and III. This is the land suited for regular cultivation. About 372 million acres of this land is used for cultivated crops and the rest is in noncrop uses.

Another 44 percent, or 641 million acres, is in classes V through VIII. About half of this acreage (49 percent) is pasture or range, 42 percent is forest or woodland, 4 percent is cropland, and 5 percent is in other uses. The cropland in these classes, 25 million acres, presents some of the most pressing land use problems of rural America. It needs to be either shifted to other uses or safeguarded by extraordinary measures.

About 12 percent, or 169 million acres, is class IV land, suited for only occasional or limited cultivation. Of this, 49 million acres is used for cultivated crops.

This then is the measure of our land. Its use and care must be everyone's responsibility, not just that of farmers, ranchers, and foresters.



Relation of land limitations and land-capability classes to safe land use.

Revised May 1969

Our land has to accommodate not only farms and ranches but also cities and towns, highways, and housing developments.

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